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METHOD OF UPDATING TERMINAL SOFTWARE IN A TELEPHONE SYSTEM

Abstract:

The invention relates to a terminal, telephone system and method for updating terminal software in a telephone system comprising a number of terminals (100, 102) and a management system (128) controlling and monitoring the operation of the terminals wherein some terminal functions are implemented by means of software. At least one software is stored in the memory (204) of the terminal. To enable the memory to be preferably implemented, when a task having no corresponding software in the memory of the terminal is selected, the terminal downloads the necessary software in the memory of the terminal from the management system (128).

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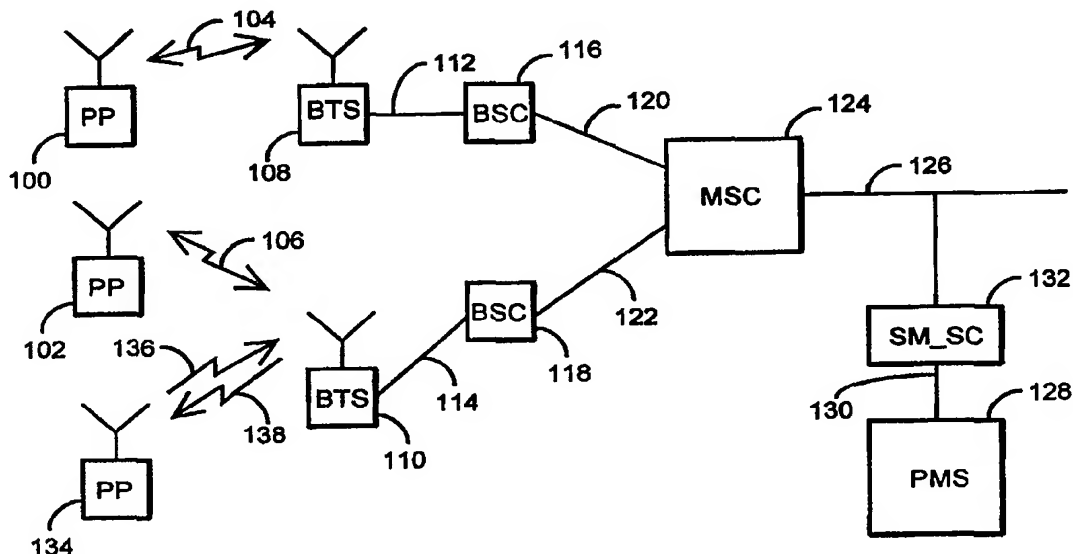
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<p>(21) International Application Number: PCT/FI99/00323</p> <p>(22) International Filing Date: 21 April 1999 (21.04.99)</p> <p>(30) Priority Data: 980887 22 April 1998 (22.04.98) FI</p> <p>(71) Applicant (for all designated States except US): NE-PRODUCTS OY [FI/FI]; Elektroniikkatie 13, FIN-90570 Oulu (FI).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): SAVOLAINEN, Kimmo [FI/FI]; Marjasuontie 1 C 15, FIN-90450 Kempele (FI). PARKKINEN, Jukka [FI/FI]; Kraaselintie 11 B, FIN-90580 Oulu (FI). HUTTUNEN, Martti [FI/FI]; Kandintie 1 G 46, FIN-90570 Oulu (FI). KANTOLA, Matti [FI/FI]; Hiidentie 4 C 2, FIN-90550 Oulu (FI). PERÄLÄ, Martti [FI/FI]; Valtatie 5 A 11, FIN-90520 Oulu (FI).</p> <p>(74) Agent: PATENTTITOIMISTO TEKNOPOLIS KOLSTER OY; c/o Kolster OY AB, Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).</p>		<p>(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>In English translation (filed in Finnish). Without international search report and to be republished upon receipt of that report.</i></p>

(54) Title: METHOD OF UPDATING TERMINAL SOFTWARE IN A TELEPHONE SYSTEM



## (57) Abstract

The invention relates to a terminal, telephone system and method for updating terminal software in a telephone system comprising a number of terminals (100, 102) and a management system (128) controlling and monitoring the operation of the terminals wherein some terminal functions are implemented by means of software. At least one software is stored in the memory (204) of the terminal. To enable the memory to be preferably implemented, when a task having no corresponding software in the memory of the terminal is selected, the terminal downloads the necessary software in the memory of the terminal from the management system (128).

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**METHOD OF UPDATING TERMINAL SOFTWARE IN A TELEPHONE SYSTEM****FIELD OF THE INVENTION**

The invention relates to a method of updating terminal software in a telephone system comprising a number of terminals and a management system controlling and monitoring the operation of the terminals wherein some terminal functions are implemented by means of software, the method comprising at least one software being stored in the memory of the terminal.

**BACKGROUND OF THE INVENTION**

With radio telephone systems becoming more common and their coverage areas growing more extensive often replacing systems implemented by fixed line telephone connections, it has become necessary to develop telephone networks utilizing radio telephone systems, such as cellular radio systems. Such telephones are needed for instance in a region where no fixed line telephone connections have been built, or in applications in which the terminal is placed in an environment with no connection to a fixed network readily available, for example in moving vehicles. The present invention can be applied particularly to systems implemented by means of cellular radio systems.

Possible systems and terminals include pay phones, wireless local loop (WLL) terminals, in-store payment terminals and smart card terminals that enable money to be transferred between a bank and a smart card.

In current terminals, most functions are implemented by means of software. A terminal comprises a processor and a memory in which necessary software is stored. When the user selects a function, the software is read in the memory and executed. Terminal design involves an inevitable compromise between the number of functions and the memory capacity available. For reasons of cost, the size of the memory to be placed in the terminals cannot be limitlessly increased; the number of functions is thus restricted by the memory.

As an example, examine a pay phone system implemented by means of a radio system. The system comprises a number of pay phones, each being connected to base stations via a radio path. As far as the radio path and the base stations are concerned, terminals operating as pay phones do not differ from common terminal equipment in any way. To enable charging, the pay phones comprise a charging means, which can typically be a reader for a pay card. Various pay cards abound, including different credit cards, loadable pay cards and bank cards. Furthermore, different card-type

variations exist, depending on the manufacturer and provider of the card. In addition, the same card can be used to select different functions. Each card variation necessitates in the terminal software that supports the card, called a card application. The card application comprises functions necessary for the user interface, card control and performing a transaction by the card, for example a payment transaction.

If card applications that support all card types were stored in the memory of a terminal reading a card, the amount of memory capacity needed would increase so much that the result would be an expensive terminal. Furthermore, adding new card applications in terminals would necessitate the software of the entire equipment to be changed in equipment maintenance.

In addition to pay phones, other wireless card-reading devices, such as pay card loading devices enabling electronic money to be loaded into pay cards from a bank account, also suffer from similar problems to those described above.

#### BRIEF DESCRIPTION OF THE INVENTION

An object of the invention is thus to provide a method and an apparatus implementing the method so as to enable the above problems to be solved. This is achieved with a method of the type disclosed in the introduction, the method being characterized by the terminal downloading necessary software into the memory of the terminal from the management system when a task having no corresponding software in the memory of the terminal is selected.

The invention further relates to a terminal in a telephone system comprising a number of terminals and a management system controlling and monitoring the operation of the terminals, the terminal comprising means for storing one or more softwares controlling the functions of the terminal. The terminal of the invention is characterized by comprising means for downloading software necessary at a given time from the management system.

The invention further relates to a telephone system comprising a number of terminals and a management system controlling and monitoring the operation of the terminals, the terminals in the system being arranged to store in their memory at least one software controlling the functions of the terminal. The system of the invention is characterized by the terminal being arranged to download software necessary at a given time from the management system

when a task having no corresponding software stored in the memory of the terminal is selected.

The preferred embodiments of the invention are disclosed in the dependent claims.

5           The invention is based on the idea that a terminal does not have all necessary software continually stored, but software can be downloaded from a telephone system when necessary. If a pay phone is used as an example, the terminal can store in its memory five cards that were last used. When a new user inserts a card into a device and the required card application does not  
10       exist in the memory, the device downloads the software from the system. The system can keep the necessary software on a particular server or on some other apparatus, for example in connection with a mobile services switching centre or a pay phone services switching centre.

          Several advantages are achieved with the method and system of  
15       the invention. The solution of the invention enables the price of a terminal to be kept low, since the amount of necessary memory capacity does not have to be increased although the number of functions and acceptable pay cards the terminal is supposed to allow increases. Further, the terminal characteristics can readily be updated according to need and location.

## 20       BRIEF DESCRIPTION OF THE DRAWINGS

          The invention is now described in closer detail in connection with the preferred embodiments with reference to the accompanying drawings, in which

          Figure 1 is a block diagram illustrating the structure of a telephone  
25       system,

          Figure 2 shows an example of the structure of a terminal of a system in accordance with the invention at a block diagram level,

          Figure 3 illustrates the structure of a terminal memory block, and

          Figure 4 shows a flow diagram of a method of the invention.

## 30       DETAILED DESCRIPTION OF THE INVENTION

          Hereinafter, the invention will be described in closer detail using a pay phone system as an example, the pay phone system being implemented by means of a digital GSM mobile telephone system without, however, being restricted thereto. It is obvious that the solution of the invention can be imple-  
35       mented with minor changes on any telephone system implemented by other

types of techniques when the system comprises terminals some of whose functions are performed by software applications.

Figure 1 illustrates the structure of a pay phone system implemented in a cellular radio network. The system comprises a number of pay phones 100 to 102, each being connected to base stations 108 to 110 via a radio path 104 to 106. As far as the radio path and the terminals are concerned, terminals operating as pay phones do not differ from common subscriber terminals in any way. Typically, the base stations 108 to 110 are connected to base station controllers 116 to 118, each controlling a plurality of base stations, via transmission lines 112 to 114, which can be implemented by means of an optical cable, a copper cable or a link connection. The base station controllers 116 to 118, in turn, are connected via transmission lines 120 to 122 to a mobile services switching centre 124, which controls the operation of the base station controllers and forwards the calls of the terminals to a fixed network or to the other parts of the cellular radio system by means of transmission lines 126.

The pay phone system further comprises a management system 128 controlling and monitoring the operation of the pay phones 100 to 102. In the pay phone system of the GSM system given by way of example the control equipment 128 is connected, utilizing for instance an X.25 connection 130, to a short message centre 132 in turn being connected to GSM cellular networks and the mobile services switching centres thereof. The above-mentioned description of a cellular radio system thus applies to the GSM system, but it is obvious that although the structure in other systems differs in details from the described one, the relevant parts in the structure are similar. It is to be noted that also in the GSM system the pay phone system can be implemented without a short message centre by using other known manners, for example by means of a modem, to connect the pay phone system's control equipment 128 to the cellular radio system.

Figure 2 illustrates an example of a preferred embodiment of a pay phone of the system in accordance with the invention. The pay phone of the invention comprises a cellular radio transceiver 200 and a control unit 204 having a direct connection 202 to the transceiver 200 without a two-wire connection. The terminal of the invention further comprises a charging means 206 connected to the control unit 204. Depending on the implementation, the charging means can accept call cards, credit cards or smart cards as means of

payment. Typically, the terminal further comprises a selection means 210 for selecting a desired phone number, display equipment 208, and an earpiece 212. The terminal can also comprise means 214 enabling a hands-free function and comprising a loudspeaker 216, a microphone 218 and necessary amplifiers. If desired, some or all of the above components can be placed integrated directly in the transceiver 200, but they can also be implemented as separate means while it is possible that the components are located inside the same housing structurally.

To enable a call to be transmitted, the transceiver 200 serves to set up a radio connection to the base station when necessary. The unit 200 is also responsible for all procedures associated with the radio path and call maintenance normally assigned to a mobile telephone.

The control unit 204 is responsible for controlling the pay phone. The control unit typically comprises a micro processor, fixed and reprogrammable memory circuits, multiplexing means and switches. The control unit controls the operation of the device's other units, keeps a record of made calls, being also responsible for charging. The operation parameters are usually stored in the memory of the control unit. These phone-specific parameters include the phone number, tariff information on calls to be made, language options on the phone's display, and the voice volume used. Excluding the inventive features described herein, the operation of the control unit does not differ greatly from the operation of the control units of the known pay phones.

Also the structure of the terminal can differ in its details from the above description, depending on the use of the terminal. If the terminal is an in-store payment terminal, for example, the device does not necessarily comprise audio parts, such as a microphone and a loudspeaker. At its simplest the device comprises a cellular radio transceiver, a control unit and a charging means, which can be integrated with each other structurally or, alternatively, components also detachable from each other to be temporarily combined for the duration of a transaction, call payment or purchase to be made, for example.

Software necessary for the terminal is stored in the memory of the control unit 204. This software includes software necessary for pay card variations, i.e. card applications. A card application comprises functions necessary for the user interface, card control and performing a card transaction, for example a payment transaction.



Figure 3 illustrates the structure of a memory. The memory, preferably implemented by one or more reprogrammable flash memory circuits, typically comprises a plurality of blocks 300 to 308 wherein software necessary for the device and other data are stored. Part of the memory is assigned to the storage of card applications, for example a block 306. A number of card applications 310 to 318 can be downloaded into this block. The memory can also be implemented in other ways, for example with battery-secured SRAM memory circuits.

Examine next the method of the invention by means of Figure 4 showing a flow diagram of a preferred embodiment of the method of the invention. In step 400 a user has inserted a card into a card reader 206 of a terminal. In step 402 the terminal examines the different functions of the card, feasible credit card alternatives, for example. In case there are several alternatives, the user is allowed to select the function to be used. Next, in step 406, it is checked whether the application required by the selected function exists in the memory of the terminal. The application keeps a record of applications in its memory at a given time. If the application exists in the memory, it can be activated in step 408.

If the application does not exist in the memory of the terminal, next it is checked in step 410 whether the application exists in the management system. Information on downloadable applications in the management system can be stored either in the terminal, or the terminal can request the information of the management system. If the application is not found in the management system, the function is rejected in step 412 and if the card comprises several functions a new one is inquired of the user.

If the application exists in the management system, the terminal inquires in step 414 about the amount of memory required by the application. Next, the terminal checks 416 whether the amount of memory required by the application is free. If there is not enough memory, an application to be removed from the memory is selected and it is removed in step 418 in order to vacate the memory for the use of the new application. The terminal can let the user select the application to be removed or, alternatively, the terminal itself can perform the selection on the basis of a predetermined criterion. A criterion can be formed, for example, such that applications used last are to be stored and an application that has been unused for the longest period of time is to be removed.

Next, in step 420 the terminal informs the management system of the free memory area in which the application should be placed. Referring to Figure 3, for example, the terminal can indicate that a memory area 312 is free for the application. In step 422, the management system downloads the application into the memory area indicated by the terminal. Subsequently, the application is ready to be put to use in step 424.

In another embodiment of the invention the management system does not control the placement of the application in the memory of the terminal but only transmits the application to the terminal, which itself places the application in its memory.

In addition to pay card applications, the downloadable software of the invention can comprise articles moved in an electronic form, such as tickets or information on timetables.

The method steps of the invention related to the terminal can preferably be implemented by software in the control unit 204 of the terminal. The connection to the management system required by the method can preferably be implemented using a data call connection. A data call is a call type available in digital radio networks, corresponding to a modem connection in analogue systems.

The terminal of the invention allows the user to be informed of the method used for example by displaying a message "wait - downloading software" or the like on the terminal's display 208.

Although the invention has been described above with reference to the example in accordance with the accompanying drawings, it is obvious that the invention is not restricted thereto but it can be modified in many ways within the scope of the inventive idea disclosed in the attached claims.

## CLAIMS

1. A method of updating terminal software in a telephone system comprising a number of terminals (100, 102) and a management system (128) controlling and monitoring the operation of the terminals wherein some terminal functions are implemented by means of software, the method comprising  
5 at least one software being stored in the memory (204) of the terminal, **characterized** by the terminal downloading necessary software into the memory of the terminal from the management system (128) when a task having no corresponding software in the memory of the terminal is selected.

10 2. A method as claimed in claim 1, **characterized** by the software being downloaded by means of a data call connection.

3. A method as claimed in claim 1, **characterized** by the terminal storing in its memory a predetermined number of various softwares, and software stored in the memory being removed in connection with the  
15 download of new software.

4. A method as claimed in claim 1, **characterized** by the terminal storing in its memory as many softwares as possible, and software stored in the memory being removed in connection with the download of new software when the memory is full.

20 5. A method as claimed in claim 3 or 4, **characterized** by the software to be removed being selected by the user of the terminal.

6. A method as claimed in claim 3 or 4, **characterized** by the software to be removed being selected by the terminal on the basis of a predetermined criterion.

25 7. A method as claimed in claim 1, **characterized** by the software being software necessary for processing a pay card fed into the terminal.

8. A method as claimed in claim 7, **characterized** by the software comprising information necessary for the terminal's user interface, pay card control and transactions performed by the pay card.  
30

9. A method as claimed in claim 1, **characterized** by the software stored in the memory at a given time being stored in a flash memory element divided into small blocks.

10. A method as claimed in claim 1, **characterized** by the  
35 software comprising articles moved in an electronic form.

11. A method as claimed in claim 10, **characterized** by the software comprising information on timetables.

12. A method as claimed in claim 1, **characterized** by the terminal detecting a pay card having been fed into the reader of the terminal and the user having selected an application, and the terminal

checking whether the software necessary for implementing the application exists in the memory of the terminal, and

transmitting a download request to the management system, the request comprising information on the necessary software, and the management system

transmitting the necessary software to the terminal, and the terminal storing the software in its memory.

13. A method as claimed in claim 1, **characterized** by the task to be performed being selected by the user of the terminal.

14. A method as claimed in claim 1, **characterized** by the task to be performed being selected by the terminal.

15. A terminal in a telephone system comprising a number of terminals (100, 102) and a management system (128) controlling and monitoring the operation of the terminals, the terminal comprising means (204) for storing one or more softwares controlling the functions of the terminal, **characterized** by comprising means (204) for downloading software necessary at a given time from the management system.

16. A terminal as claimed in claim 15, **characterized** by the terminal comprising means (204) for storing in the memory a certain number of softwares, and the terminal comprising means (204) for replacing a previous software in the memory with software to be downloaded.

17. A terminal as claimed in claim 16, **characterized** by the terminal comprising means (204) for selecting software to be removed.

18. A terminal as claimed in claim 15, **characterized** by the terminal comprising a card reader (206).

19. A terminal as claimed in claim 15, **characterized** by the memory means of the terminal being implemented by a flash memory circuit divided into small software blocks (300 to 318).

20. A telephone system comprising a number of terminals (100, 102) and a management system (128) controlling and monitoring the operation of the terminals, the terminals in the system being arranged to store in their

memory at least one software controlling the functions of the terminal, **characterized** by the terminal being arranged to download software necessary at a given time from the management system when a task having no corresponding software stored in the memory of the terminal is selected.

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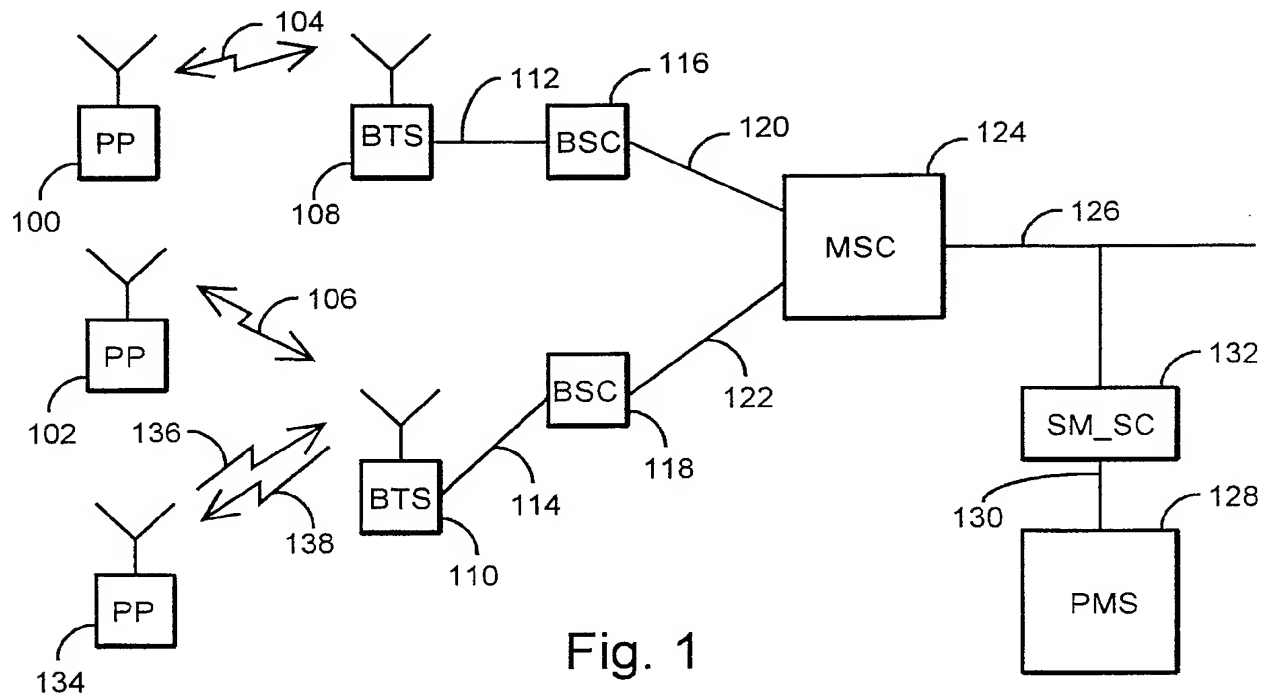


Fig. 1

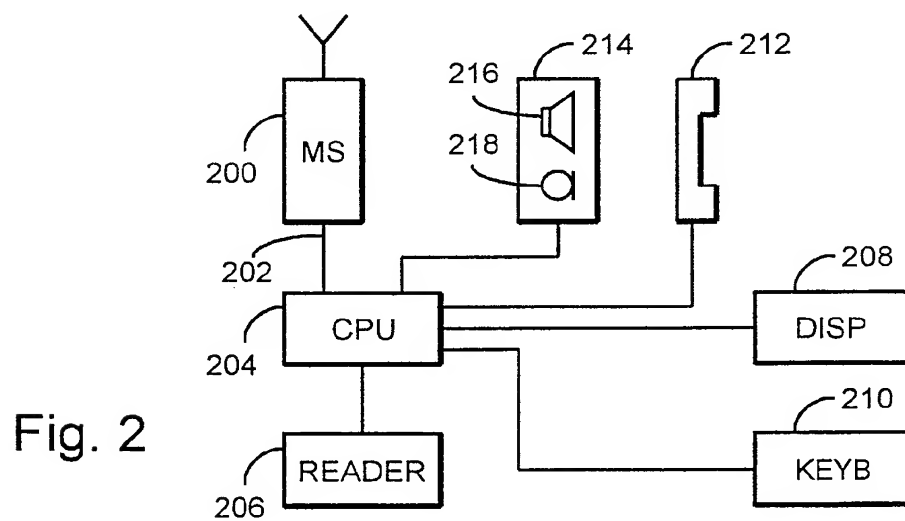


Fig. 2

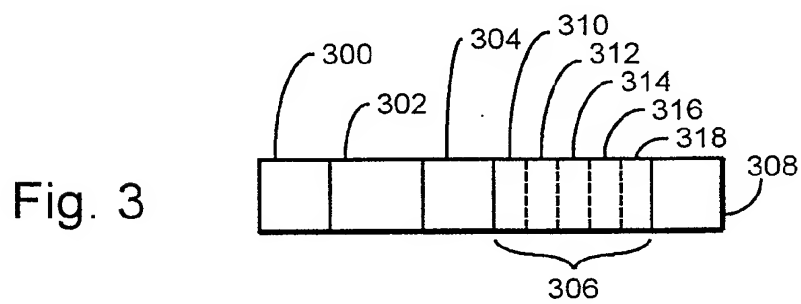


Fig. 3

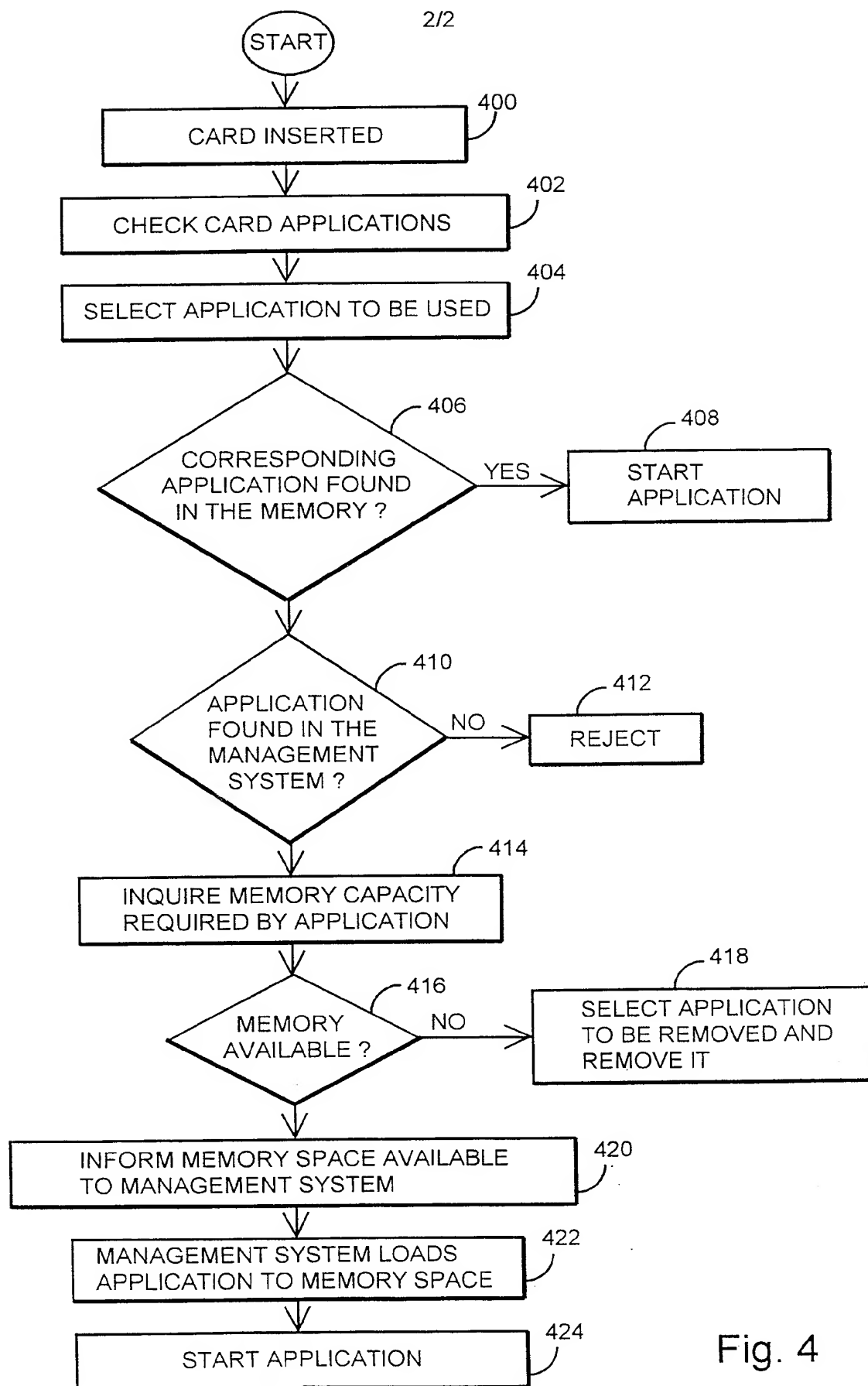


Fig. 4